just make a couple of points. I am too long out of law school to remember how many centuries into the development of property law we are, but it is many.

And that is dealing with something that the judicial system can readily understand. They can go out and look at it. If you have a road that's an easement on a piece of property, it is comprehensible.

I don't have a lot of optimism about throwing interference resolution to the judicial system. To a large extent that's why the Commission was created. Again, it may not be a perfect mechanism, but it is a working mechanism, and it is a mechanism with considerable expertise here.

To just say that we will create rights, and we will adjudicate rights, and we will do that in the normal court process and system I think has all sorts of difficult risks and costs involved in it.

MR. ENGELMAN: Okay. Gerry.

PROF. FAULHABER: I disagree with one point that you made and agree with others. The notion of saying that spectrum is a public resource. Well, I mean, everything is a public

resource, okay? If you put it in that term, it sort of turns it into a religious issue, which I just don't think is helpful.

What is more interesting I think is the notion of the opportunistic use, okay? And I gave you sort of the short-mouth version of it, but thanks for your question, because it gives me an opportunity to explain it a little bit more.

The notion that we are proposing is one where people do indeed have property rights to spectrum; what is not held by the government -- and what would be on the private side -- but would be subject to what we refer to as a non-interference easement.

Which is to say that you would have rights to the spectrum and to use it whenever you want it, and to be free of interference. But you would not have the right to exclude others when you were not broadcasting.

So this would work for cognitive radio, or agile radio, provided that if he wants to have his cops call somebody, and you are in the way, you are going to be subject to a very heavy fine if you don't get out of the way.

It also works for ultra wideband, and

of course, let me say that these are not the answers to the Maiden's Prayer. There are little problems with these things about saying can you actually get out of the way quickly enough.

There is some unsettled technical issues on that one but the notion of our proposal of putting in a non-interference easement is precisely to enable these new, very agile, software defined radios, ultra wideband, to operate within the -- in essentially a commons context within a property rights model.

So that's -- specifically, we put that in there for those particular issues so that we could get the benefit of commons. Now, let me sort of respond to this. While everything is okay, and the FCC is just cooking along, and why are we going to go to a property rights model.

I would say the Gosplan model had worked pretty well up until maybe 5 or 10 years ago, when we basically recognized that we had given away all the spectrum, and if anybody is going to get it now, it is going to be a zero sum gain.

Now we find -- well, let me just say that something which would be really simple for not a very major agency to kind of make these

decisions, now all of a sudden is occupying the minutiae of spectrum allocation; the White House -- okay, we are talking about military versus civilian; the Supreme Court, next wave decision; and the U.S. Congress, which is adjudicating the Nextel 800 megahertz public safety stuff.

All of a sudden this is way above the FCC's pay grade, okay? To me that is evidence that this Strauss plan is not working well. It is broken, or else it wouldn't be bumped up as high as it is.

MR. WILKINS: The comment that I would in fact actually make is that the gentleman who commented earlier regarding private industry spectrum. That is where our focus is, and that is where we are really applauding the FCC's efforts to look at secondary markets.

And we think that the private industry is really where the focus should be. Secondly, I think if you have a minimal set of defined rules, and that would be included in the standardized contract. That would discuss and address the co-channel spectrum and the adjacent channel spectrum for interference, and then address specifically that those issues could be addressed.

MR. MARSHALL: I think in a way perhaps the idealogy of the property rights issue overwhelms the reality. The real issue is how much is parklawn, commons, and how much of it is privately held. And what is the expense.

So you could probably find good solutions in any of the models. The gory issue is which part is point revenue producing and which point is distributed revenue unit producing.

I will put in the plug that the internet has probably produced more wealth and lost more in the last several decades than anything that we can conceive of, and yet it has very few point sources
of revenue. And the property model almost implies point source.

It works well for cell phone, and it works well for what we all use today, the Blackberry. There is no reason to believe that that is the model 30 years from now. And I think if we over-rely on it and put more -- and again it is zero sum. What we put into private property rights is gone forever into public use.

And we ought to be holding open at least the rights of the public use to expand,

unless you can take it back, which we have not grappled with, and until we get around, and I think that is a fair question.

The issue unsaid in all of this is how do you rebuild your plan, and the FCC has some questions here, and that is perhaps one I would like to get through one more time. What do you do when you are wrong, but we will go around then hit it.

MR. HARASETH: Just to respond real quickly and then I have some other things, too, the way that you were just saying it, and it is the words, "eminent domain." If there is for some reason or other the public safety for the public good needs access through spectrum somewhere, there is ways of doing that with property right now, and there come be ways of doing that there.

The other thing that I wanted to point out is that there is models right now that do exist where some of what we are talking about does work, or is, or could conventionally be working, even within the framework of the FCC's rules and regulations.

You have scenarios right now that that weren't discussed in the open two years ago. You

have a situation right now where you could have commercial radio providers that are, (a), providing the 911 wireless link to a dispatch center, that over the same exact system could be providing the dispatch service for the delivery of that 911 service.

Now, here is the conundrum in that situation. Do you put the priority on receiving a 911 call from a mother whose child just went in the pool, or do you put it on dispatching the service to that person.

So that is a difficult thing there, but that model does exist right now. It's there. The capability is there, and I don't know if it is actually being used, but it is being talked about.

DR. GOLDBURG: Two things in response to the question. The first one is that we heard some efficiency numbers being thrown around. You know, most systems today only use 15 percent of the spectrum, or 20 percent of the spectrum.

That actually may not be very bad. So no one designs or operates systems ever at a hundred percent capacity. So eithernet, which is what most of have running to our desks, that

actually is sort of a theoretical limit of about 35 percent throughput.

Wireless LANs, and I would guess 802.11 is similar, because it has a similar access scheme. If the phone company designed your phone system so that it ran at a hundred percent capacity all the time, you wouldn't like it, because most of the time you wouldn't get a connection.

So it is just important to keep in mind that 15 or 20 percent may not necessarily be a bad number depending on what the application is.

And then the second comment that I wanted to make has to do with -- and maybe this is directly related to property rights issues. What do you expect in return for the spectrum that you have bought. I mean, sort of one of the principles of licensed spectrum has been that not only are you allowed high powered operation, which means that you can cover large areas, but it means that you have a predictable interference environment.

So you paid -- one of the things that you paid for is predictable interference environments, which means that you can offer a guaranteed grade of service to customers, and that might actually be a very efficient -- you know, in

the economic sense -- use of the spectrum.

With unlicensed, which has other advantages, one of the disadvantages is that you have an unpredictable interference environment. So it is very hard to provide services with any guaranteed grade of service in that sort of spectrum at least if there is other users there.

MR. ENGELMAN: Gerry, and then there was another question in the audience.

PROF. FAULHABER: Let's go to the audience first.

MR. ENGELMAN: All right. Then I saw one off about 10 minutes ago off on the right flank here. Way over on this side if you could, please.

MR. WEISS: Merrill Weiss, Merrill Weiss Group. I actually have a comment and a question. The comment is that I keep hearing the number bandied about during the discussions about only 15 percent of the population getting their television from broadcasts.

And I think that is misinformation. If you take the number of people who get -- who take cable service and satellite service, that will add up to 85 percent. And so, yeah, you think that leaves 15.

But what that doesn't take into account is that there are an awful lot of people who have cable or satellite on one t.v., and they own five, or something along those lines.

And so there are a lot more people than 15 percent who get over-the-air broadcast service, and we learned that lesson the hard way on September 11th in New York, when all of a sudden when the broadcast towers went town, or the broadcast stations went down, and we provided service to the cable head ends, the calls that kept coming from places that were well beyond the 15 percent that were assumed to be out there in -- you know, it was always assumed that it was the poor neighborhoods that couldn't afford cable that were watching broadcasts.

And the calls started coming from the upscale neighborhoods saying, well, we can't get it in our bedroom, or we can't get it in our kitchen, or whatever. So that there were an awful lot more people who were watching broadcast.

And that's in fact what is giving the New York broadcasters the push at this point to try and get their transmitters back on the air, because they are realizing that they are missing a much

larger part of the audience, and a much different part of the audience than they thought they were. So just a comment.

The question is if you go to a property rights approach, how do you handle the kinds of changes in technology that we were talking about this morning, where you want to be able to bring in, for instance, better receiver capabilities, and you want to be able to bring in the capabilities that are allowed by some of the new technologies.

If you have locked in interference rights in an ownership provision, whatever it is -- a contract or some kind of lead to spectrum -- then how do you over time force that to adopt better technology so that it provides better protection to its neighbors.

Under the licensing provisions that we have now, where there are rules, you at least have the ability over time to tell licenses that you must at a certain time upgrade what you are doing.

We have seen that, for instance, in the use of microwave spectrum, where we all of a sudden had certain kinds of dish performance that was required. We are seeing it now in broadcast, and there is a conversion from analog to digital that

is being required, however slowly it is occurring. But it is still a requirement.

How do we manage the spectrum going forward where we want to make sure that those improvements are taken advantage of when you have a property rights environment.

MR. ENGELMAN: Let's go to Gerry, since he is

the largest proponent at the table at least.

PROF. FAULHABER: Let me handle a number of points here, starting with Preston's. Once we put it in the private domain, it is forever lost to the public? I don't think so. I think we have answered that one.

There is also another way in which you can get it back in the public domain, and that is just that the public can buy it. That is kind of how markets work.

If we want to set up a national park, we could do it by buying the land. That works perfectly well. You are not conjoined from owning land because you are the Federal government. The Federal government in fact is the largest landowner in the United States.

And we can do it, and if there is some

kind of a holdup problem, then we have eminent domain. This is all like fairly straightforward.

Okay. The 15 to 20 percent efficiency, and let me take you on on that one, Marc. In a static model, where you buy -- let's take the telephone company, where you buy the switches and the trunks, and they are yours.

And there is time bearing demand, and yeah, you are going to get an average efficiency, which is sort of 15 to 20 percent. Similarly, if you have to glome on to 24 hours, 7 days, 365 spectrum, yeah, you are going to get kind of lousy -- but I think some of the technologies that we have been talking about give rise to dynamic allocational efficiencies.

What you are talking about is that you are getting a low efficiency if you have to do static allocations. You know, this is yours, and you are going to have it forever. But if you can start to do some of this dynamic allocation -- and oh, in the static efficiency, we are really bad on that, too.

But if you have this dynamic efficiency, I think in the long run you could get much higher efficiencies. Fifteen percent of

households. I think I was fairly careful, although somewhat telegraphic to say, that 85 percent of households get their primary delivery through a paid subscription model.

There is a lot of rich guys who have, you know, that broadcast television 13 inch in the workroom. And if they were calling after 9-11, I think the right advice is go to your living room.

Now, the notion of how this property right -- you know, in the property rights model, what do we do about evolving technology. What do we do about new standards. Well, surely these have been extremely difficult to do in the Gosplan model.

And whenever we start talking about putting receiver requirements, which is kind of where you are going with this, everybody sort of gets their undies in a bunch on this, and says, oh, wow, we can't do this.

I would think -- and this is spelled out in a little more detail in the paper that we submitted to this, but basically I think in private markets that receiver standards can be on the table, and they would be on the table within private markets, because there is not that many

people that would actually make the chips that go in the receiver.

And if there is money to be made by changing the chips, then over time as we have in the computer business, you know, shifting bus architectures and so forth, that would get built into the hardware by a common agreement that, yeah, we can all make more money if we build in better filters.

Yeah, I think that will happen. No, I think it will happen in the private market. But there is more to that than I can really explain right now.

MR. WILKINS: Just one more comment. On the agreement of the trading document or master agreement that you would be using as an instrument so to speak. It is a working document, and it is a changeable document, and so its technology changes as things change, and then you can incorporate that into the document.

So over time it would not be -- you know, the document, let's say it was traded for any type of commodity maybe 10 or 15 years ago, is probably not the same document that it is today.

MR. MARSHALL: I would like to get one

more topic in.

DR. GOLDBURG: A quick response to Gerald's comment. The 35 percent number that I quoted for ethernet, for example, was for a heavily loaded ethernet, with lots of users on it. So there is no -- it is not a sense of averaging over days or weeks. It is just intrinsically that's the way that the mechanism works.

And somehow the notion that by allowing other technologies to try to -- throwing other technologies in the mix when you already have a system that is completely loaded is going to drive up -- I mean, 35 percent is completely loaded in our case, and it is going to drive up the throughput.

I think it is a seductive concept, as most sort of self-organizing technologies are, but what people find when they go out and deploy sort of self-organizing technologies is that it always reaches some equilibrium point, but it is almost always a local minimum, as opposed to -- or a local maximum, as opposed to a global one.

So I guess I am a little concerned. We are supposed to be looking at the future here, which is good, but in sort of the near term, the

next 5 to 10 years, I wonder if we are starting to write policy checks that the technology is not going to be able to cash for us.

MR. MARSHALL: It is a shame that Paul didn't invite someone to defend Gosplan. That would make it a really interesting afternoon. One final topic that I would like to hit on very quickly, and then we will go around and summarize, is are there incentives that can be utilized instead of regulations to promote spectrum efficiency. Marc.

DR. GOLDBURG: Sure. I think -- I am going to make a quick comment here, and let maybe some of the more economically-minded folks fill out some of the details.

But certainly through the auction process there is a way to promote spectral efficiency, either indirectly, just in that the people who can provide the most services over the spectrum get potentially the greatest cash return, and so they are incentivized to be spectrally efficient.

Or maybe having some way of -- I think someone mentioned pollution credits earlier this morning, and one could also have spectral

efficiency credits. So the Commission could, for example, and I guess this is a regulation, but have a series of targets. Maybe they are recommended targets.

And to the extent that people get close to them, they may get some benefit in terms of a discount at the auction, or extended lifetime for their lease; and to the extent that they are far away from them, they get penalized somehow.

MR. LYNCH: I will probably repeat myself, at least as far as commercial systems go, that I don't think that spectral efficiency is necessarily the same thing as efficient use. And you have to take into the equation what is the technology, and what is the cost basis, and the entire thing, and not just simply how much are you pushing down the pipe.

And that is for commercial systems. Now let's get into public protection systems and this kind of thing. You really have to get down to what is that system expected to do and at what time of the day, and what standards.

If these guys are using like WPS or PAS, and getting a piggyback on Cingular's network, that is one model. But if they are using a

dedicated system, just because it only answers emergencies once a day, seven days a week, I think that has to be a different model, and effective use rather than spectral efficiency.

MR. HARASETH: I will go back to the auction thing to agree with public safety, and state that as an incentive to get enhanced efficiency and public safety, you are going to have to tie some dollars to that to fund it.

And the auction is one way to do it. Whether it is auctioning spectrum X out here for some vendor to so something else, and some of it is earmarked for public safety is one thing. The other one is okay, even if it is public safety spectrum, and the excess capacity on it was auctionable directly as a secondary market for public safety.

As long as public safety can meet its needs with the returns on that auction. Maybe it wouldn't be money. Maybe it would be access on the system to certain levels that we are talking about.

I am not so sure that that isn't even a possibility right now with the 700 State spectrum that was allocated at 700. So that is not a real far-fetched thing to think about.

MR. MARSHALL: I would just comment that I think efficiency is much easier to measure in someone else's system than in your own, and it is of marginal use with engineers, and probably not a lot to policy makers.

MR. WILKINS: Of course, my comment is going to be that incentives is in the eyes of the beholder, and the value is in the eyes of the beholder of the spectrum, and I will let the market decide what the incentives are.

PROF. FAULHABER: I can't say it better myself. thank you.

MR. FITCH: I agree with Michael Lynch's comment that, first of all, you have to consider the intended use and you are measuring against an actual requirement, as opposed to a kind of theoretical calculation.

I think a lot of incentives can be created by the commission letting groups of users or licensees, licensed or unlicensed, collaborate and figure out how to optimize utilization of spectrum. There are many instances in which this is already done.

Auctions aren't a be all and end all, and as we have seen, they don't necessarily deliver

service in every case at all, let alone the most efficient service in every case.

You can also do user or regulatory fee structures that promote greater efficiency, particularly if you are trying to move from a current environment to a future environment where there is already been a fair amount of user buy-in.

They know that they are going to transition, and they know how they want to transition, and the issue is pace. That can certainly be incentivized.

MR. MARSHALL: You can't resist. Go.

PROF. FAULHABER: In 1988, I was actually visiting the Soviet Union and talking to the Gosplan guy.

MR. MARSHALL: You can represent them here then.

PROF. FAULHABER: Yeah, right. So I will be the Gosplan guy. And some factory owners and what have you. Not owners, obviously. But to a man, there was no factory manager who thought that Gosplan was a bad idea. Everybody that was in the system thought it was a grand scheme, and that we should continue, but that we should try and do Gosplan better.

And I think that we need to kind of resist that temptation, I think, and to say, well, Gosplan is really okay. We just have to be a little focused more on it, and do it a little better.

That doesn't work, okay? Those Gosplan guys were really smart. They really were, okay? Just like the guys at the FCC are really smart. It is the system, and it is not the guys. It just doesn't work.

MR. MARSHALL: Okay. I think what I would like to do is spend a little bit of time going around the panel, and then if we have some time, around the room. The objective of this whole thing was to help Paul make some recommendations, rather than divide them into divergent directions.

So I would like to go around the room and if each one of us could go up and make one recommendation -- policy, rule, whatever -- to improve spectrum efficiency, and what would that be, and what you think the argument for it is. And we will start down with Marc again.

DR. GOLDBURG: I am going to have to start reading the questions in the future before

they make it all the way around this way. I think what I would like to see in the future, and this will actually take some work, is an allocation -- the secrets of flexible allocations that group like services.

So wide area with -- blocks of allocations for wide area systems, and for local area systems, and blocks of allocation for broadcast systems, and two-way systems. Blocks of allocations for TDD systems and FDD systems.

And I think if one categorizes the technologies that way, even though we could have a religious war over the best two-way FDD cellular or interface, we would find at the end of the day that the performance and the requirements of those technologies are actually all pretty similar.

So it would be possible to set aside chunks of spectrum for certain general uses, but then still allow technical innovation and freedom of technology choice within them.

MR. LYNCH: Well, either Marc is a psychic or he has been watching Nortel for the last couple of years.

DR. GOLDBURG: I think you have been watching us.

MR. LYNCH: No, no, no, no. But the idea of blocks identified, blocks of spectrum identified for like services is something that we have been promoting on the international arena, and I am sure that Rick is probably tired of hearing us in Geneva talk about that.

But the whole concept of whether it is fixed service, mobile service, whatever, identify the spectrum, and stay the heck out of the channelization, and let the operators and the vendors figure that out, and you will find out that we have work systems that work pretty well with each other in there.

And it minimizes your pain, and if you say, okay, it is 2 times 20, fine, have a nice life. I don't care if it is 1-1/4 or 25 kilohertz channels or what. Just market it, take it, make it work.

MR. MARSHALL: Okay. Ron.

MR. HARASETH: I don't think there is any one rule or policy, and I really can't restrict myself to one that way. The FCC rules as they exist right now have promulgated over many, many years, many, many years, and it just kind of built on themselves to the point where there are so many

archaic bits and pieces that left hanging over there that really slow us down, even today as we speak.

I have got situations right now in my own environment coordinating frequencies where we are getting requests for a UHF control channel which theoretically should be used for LAN mobile radio use, and it is in an environment where there is hardly any LAN mobile radio spectrum left for mobile operation, but they want to use it to link other frequencies in LAN mobile.

And the reason that they want to do it is because they don't want to pay the premium to get a wireline service to link something together somewhere. And there is absolutely nothing in the rules and regulations that really prevent them from using that frequency in that manner.

And yet morally I am at horror about them using it that way, and it is because of the way the rules are essentially written, and it gets right into the fixed-service, mobile-service, and things like that.

But it goes way beyond just that.

It is just the way that they are, and there are things that they could change right now,